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Guenter W. Gross, Ph.D.

North Texas State
University
Denton, Texas

Dr. Gross received his B.S. in engineering physics from Stevens Institute of Technology in Hoboken, N.J., in 1962. For the following 5 years, he served as a pilot with the U.S. Air Force and participated as project officer in the acceptance testing of the Gemini rendezvous radar system. He returned to graduate school in 1968 and received a Ph.D. in biophysics and neurophysiology from Florida State University in 1973. From 1974 until 1977, he was associated with the Experimental Neuropathology Section at the Max Planck Institute for Psychiatry in Munich. He also worked as a visiting scientist for the Sandoz Corporation in Basel, Switzerland, in the fall of 1977. He is presently an associate professor of neuroscience with the Department of Biological Sciences at North Texas State University (NTSU), and director of the newly established NTSU Center for Networks Neuroscience.

MULTIELECTRODE BURST PATTERN FEATURE
EXTRACTION FROM SMALL MAMMALIAN NETWORKS IN CULTURE

Abstract

We are investigating the properties of small (100 to 400 neuron), monolayer networks grown in culture from dissociated mouse spinal cord tissue on glass plates featuring 64 photoetched microelectrodes. These networks form vigorous organotypic activity that becomes organized with time. At 4 weeks after seeding, the cultures exhibit synchronized burst patterns on many electrodes. The spontaneous activity can be maintained for as long as 100 days in culture and is often rhythmic. Network disinhibition via the inhibitory synapse blockers strychnine and bicuculline produces rapid, rhythmic bursting in all cultures with highly stereotyped spike patterns within the bursts, regardless of the nature of the prior spontaneous activity. Data are processed on two levels: (1) burst pattern analysis in terms of burst frequency, duration, and period, and (2) analysis of spike patterns within bursts. Data compression is achieved by burst integration which preserves the character of the spike patterns. Integrated bursts are being classified according to shape and identified with letters, allowing 2 hours of activity on one electrode to be condensed to one page of letter sequences. Pattern recognition and cross-correlations with other electrodes are therewith simplified. In view of the fact that all synapses integrate spike trains, the ignoring of detailed spike information is reasonable and makes real-time, statistical analysis of compressed multichannel data possible.